

Music and Alzheimer's disease – assessment and therapy: discussion paper

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Dementia is an important source of chronic disability leading to both spiralling health care expenditure among the elderly and a progressive disturbance of life quality for the patient and his or her family. With anticipated increases in the population of the elderly in Europe, then it is timely to find treatment initiatives in the Western world which will ameliorate the impact of this problem. Music therapy while not offering a cure for such a disease may be in a position to offer amelioration of the impact of the disease and provide a valuable adjunct to diagnosis.

The diagnosis of Alzheimer's disease is prone to error and authors differ as to the difficulty of making a precise diagnosis. In the early stages of the disease the symptoms are difficult to distinguish from those of normal aging, a process which itself is poorly understood. A second source of error in diagnosing Alzheimer's disease is that it is masked by other conditions. Principle among these conditions is that of depression which itself can cause cognitive and behavioural disorders.

Clearly Alzheimer's disease causes distress for the patient. The loss of memory and the accompanying loss of language, before the onset of motor impairment, means that the daily lives of patients are disturbed. Communication, the fabric of social contact, is interrupted and disordered. The threat of progressive deterioration and behavioural disturbance has ramifications not only for the patients themselves, but also their families who must take some of the social responsibility for the care of the patient, and the emotional burden of seeing a loved one becoming confused and isolated.

A brief cognitive test, the Mini-Mental State Examination (MMSE), has been developed to screen and monitor the progression of Alzheimer's disease. As a clinical instrument it is widely used and well validated in practice. As a bed-side test the MMSE is widely used for testing cognition and is useful as a predictive tool for cognitive impairment and semantic memory without being contaminated by motor and sensory deficits. The items which the MMSE fails to discriminate (minor language deficits), or neglects to assess (fluency and intentionality) may be elicited in the playing of improvised music. A dynamic musical assessment of patient behaviour, linked with the motor co-ordination and intent required for the playing of musical instruments used in music therapy, and the necessary element of interpersonal communication, may provide a sensitive complementary tool for assessment¹.

Music and dementia

Late in adult life, at the age of 56 years, and after completing two major concertos for the piano Maurice

Ravel, the composer, began to complain of increased fatigue and lassitude. Following a traffic accident his condition deteriorated progressively. He lost the ability to remember names, to speak spontaneously and to write. Although he could understand speech he was no longer capable of the coordination required to lead a major orchestra. While his mind, he reports, was full of musical ideas, he could not set them down. Eventually his intellectual functions deteriorated until he could no longer recognize his own music. Even in a composer of his standing, with what we may guess was a progressive dementing illness, his active music-making capabilities deteriorated, albeit after speech failed.

However, the responsiveness of patients with Alzheimer's disease to music is a remarkable phenomenon. While language deterioration is a feature of cognitive deficit, musical abilities appear to be preserved. This may be because the fundamentals of language itself are musical, and are prior to semantic and lexical functions in language development.

Although language processing may be dominant in one hemisphere of the brain, music production involves an understanding of the interaction of both cerebral hemispheres. In attempting to understand the perception of music there have been a number of investigations into the hemispheric strategies involved. Much of the literature considering musical perception concentrates on the significance of hemispheric dominance. Gates and Bradshaw² conclude that cerebral hemispheres are concerned with music perception and that no laterality differences are apparent. Other authors suggest that two processing functions develop with training where left and right hemispheres are simultaneously involved, and that musical stimuli are capable of eliciting both right and left ear superiority. Similarly, when people listen to and perform music they utilize differing hemispheric processing strategies.

Evidence of the global strategy of music processing in the brain is found in the clinical literature. In two cases of aphasia³ singing was seen as a welcome release from the helplessness and a means to communicate thoughts externally. Berman⁴ suggests that recovery from aphasia is not a matter of new learning by the non-dominant hemisphere but a taking over of responsibility for language by that hemisphere. The non-dominant hemisphere may be a reserve of functions in case of regional failure.

Little is known about the loss of musical and language abilities in cases of global cortical damage. Any discussion is necessarily limited to hypothesizing as there are no established baselines for musical performance in the adult population. Aphasia, which is a feature of cognitive deterioration, is a complicated phenomenon. While syntactical functions may remain

Table 1. Features of medical assessment and musical assessment

Medical elements of assessment	Musical elements of assessment	Examples of improvised playing
Continuing observation of mental and functional status	Continuing observation of mental and functional status	<ul style="list-style-type: none"> ● Improvisations using rhythmic instruments (drum and cymbal) singly or in combination, ● improvisations using melodic instruments ● singing and playing folk songs with harmonic accompaniment
Testing of verbal skills, including element of speech fluency	Testing of musical skills; rhythm, melody, harmony, dynamic, phrasing, articulation	<ul style="list-style-type: none"> ● playing tuned percussion (metallophone, xylophone, chime bars) demanding precise movements
Cortical disorder testing; visuo-spatial skills and ability to perform complex motor tasks (including grip and right left co-ordination).	Cortical disorder testing; visuo-spatial skills and ability to perform complex motor tasks (including grip and right left co-ordination).	<ul style="list-style-type: none"> ● alternate playing of cymbal and drum using a beater in each hand ● co-ordinated playing of cymbal and drum using a beater in each hand ● co-ordinated playing of tuned percussion
Testing for progressive memory disintegration	Testing for progressive memory disintegration	<ul style="list-style-type: none"> ● the playing of short rhythmic and melodic phrases within the session, and in successive sessions
Motivation to complete tests, to achieve set goals and persevere in set tasks	Motivation to sustain playing improvised music, to achieve musical goals and persevere in maintaining musical form	<ul style="list-style-type: none"> ● the playing of a rhythmic pattern deteriorates when unaccompanied by the therapist, as does the ability to complete a known melody, although tempo remains
'Intention' difficult to assess; but considered important	'Intention' a feature of improvised musical playing	<ul style="list-style-type: none"> ● the patient exhibits the intention to play the piano from the onset of therapy and maintains this intent throughout the course of treatment
Concentration and attention span	Concentration on the improvised playing and attention to the instruments	<ul style="list-style-type: none"> ● the patient loses concentration when playing, with qualitative losses in the musical playing and lack of precision in the beating of rhythmical instruments
Flexibility in task switching	Flexibility in musical (including instrumental) changes	<ul style="list-style-type: none"> ● initially the musical playing is limited to a tempo of 120 bpm and a characteristic pattern but this is responsive to change
Mini-mental state score influenced by educational status	Ability to play improvised music influenced by previous musical training	<ul style="list-style-type: none"> ● although the patient has a musical background this is only of help when she perceives the musical playing, it is little influence in the improvised playing
Insensitive to small changes	Sensitive to small changes	<ul style="list-style-type: none"> ● musical changes in tempo, dynamic, timbre and articulation which at first are missing are gradually developed
Ability to interpret surroundings	Ability to interpret musical context and assessment of communication in the therapeutic relationship	<ul style="list-style-type: none"> ● the patient develops the ability to play in a musical dialogue with the therapist demanding both a refined musical perception and the ability of musical production

longer, it is the lexical and semantic functions of naming and reference which begin to fail in the early stages. Phrasing and grammatical structures remain giving an impression of normal speech, yet content becomes increasingly incoherent. These progressive failings appear to be located within the context of semantic and episodic memory loss illustrated by the inability to remember a simple story when tested.

Musicality and singing are rarely tested as features of cognitive deterioration, yet preservation of these abilities in aphasia has been linked to eventual recovery, and could be significant indicators of hierarchical changes in cognitive functioning. Jacome⁵ found that a musically naive patient with transcortical mixed aphasia exhibited repetitive, spontaneous whistling and whistling in response to questions.

The patient often spontaneously sang without error in pitch, melody, rhythm and lyrics, and spent long periods of time listening to music. Beatty⁶ describes a woman who had severe impairments in terms of aphasia, memory dysfunction and apraxia yet was able to sight read an unfamiliar song and perform on the xylophone which to her was an unconventional instrument. Like Ravel, she no longer recalled the name of the music she was playing.

Swartz and his colleagues⁷ propose a series of perceptual levels at which musical disorders take place:

- (i) the acoustico-psychological level, which includes changes in intensity, pitch and timbre.
- (ii) the discriminatory level, which includes the discrimination of intervals and chords.

(iii) the categorical level which includes the categorical identification of rhythmic patterns and intervals.

(iv) the configural level, which includes melody perception, the recognition of motifs and themes, tonal changes, identification of instruments, and rhythmic discrimination.

(v) the level where musical form is recognized, including complex perceptual and executive functions of harmonic, melodic and rhythmical transformations. In Alzheimer's patients it would be expected that while levels (i), (ii) and (iii) remain unaffected, the complexities of levels (iv) and (v), when requiring no naming, may be preserved but are susceptible to deterioration.

It is perhaps important to point out that these disorders are not themselves musical, they are disorders of audition. Only when disorders of musical production take place can we begin to suggest that a musical disorder is present. Improvised musical playing is in a unique position to demonstrate this hypothetical link between perception and production.

Descriptions of musical perception emphasize the importance of context where different levels of attention occurring simultaneously against a background temporal structure. Musical improvisation with a therapist, which emphasizes attention to the environment utilizing changes in tempo and volitional response, without regard for lexical content, may be an ideal medium for treatment initiatives with Alzheimer's patients. The playing of simple rhythmic patterns and melodic phrases by the therapist, and the expectation that the patient will copy those patterns or phrases, is similar to the element of 'registration' in the mental state examination.

While improvised musical playing is a useful tool for the assessment of musical abilities, it is also used within a therapeutic context. In this way assessment and therapy are interlinked; assessment providing the criteria from which to identify therapeutic goals and develop therapeutic strategies.

If we are unsure as to the normal process of cognitive loss in aging, we are even more in the dark as to the normal musical playing abilities of adults. The literature suggests that musical activities are preserved while other cognitive functions fail. Alzheimer patients, despite aphasia and memory loss, continue to sing old songs and to dance to past tunes when given the chance. However, the production of music, and the improvisation of music appears to fail in the same way in which language fails. Unfortunately no established guidelines as to the normal range of improvised music playing of adults is available.

Improvised music therapy in our experience appears to offer the opportunity to supplement mental state examinations in areas where those examinations are lacking (Table 1). First, it is possible to ascertain the fluency of musical production. Second, intentionality, attention to, concentration on and perseverance with the task in hand are important features of producing musical improvisations and susceptible to being heard in the musical playing. Third, episodic memory can be tested in the ability to repeat short rhythmic and melodic phrases. The inability to build such phrases may be attributed to problems with memory or to a yet unknown factor. This unknown factor is possibly involved with the organization of time structures. If rhythmic structure is an overall context for musical production, and the ground structure for perception¹, it can be hypothesized that it is this overarching

structure which begins to fail in Alzheimer patients. A loss of rhythmical context would explain why patients are able to produce and persevere with rhythmic and melodic playing when offered an overall structure by the therapist, and would suggest a global failing in cognition while localized lower abilities are retained.

Music therapy appears to offer a sensitive assessment tool. It tests those prosodic elements of speech production which are not lexically dependent. Furthermore, it can be used to assess those areas of functioning, both receptive and productive, not covered adequately by other test instruments; ie fluency, perseverance in context, attention, concentration and intentionality. In addition it provides a form of therapy which may stimulate cognitive activities such that areas subject to progressive failure are maintained. Certainly the anecdotal evidence suggests that quality of life of Alzheimer patients is significantly improved with music therapy accompanied by the overall social benefits of acceptance and sense of belonging gained by communicating with others. Prinsley recommends music therapy for geriatric care in that it reduces the individual prescription of tranquilizing medication, reduces the use of hypnotics on the hospital ward and helps overall rehabilitation. He recommends that music therapy be based on treatment objectives; the social goals of interaction co-operation; psychological goals of mood improvement and self-expression; intellectual goals of the stimulation of speech and organization of mental processes; and the physical goals of sensory stimulation and motor integration⁸.

The understanding of musical production may well offer a clue to the ground structure of language and communication in general. It is research in this realm of perception which is urgent not only for the understanding of Alzheimer's patients but in the general context of cognitive deficit and brain behaviour.

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An extended list of references can be obtained from the author.

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